



How Ex-Post Coping Strategies Aggravate Poverty Traps in Uganda: Evidence from Panel Data

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Abstract

The use of multiple ex-post poverty coping strategies can potentially aggravate the state of poverty trap among households. However, there is paucity of empirical evidence about how such coping strategies perpetuate poverty traps in Uganda's case. This study examines and tests the effect of ex-post coping strategies on Uganda's households living in poverty trap using panel data. A two stage dynamic S-GMM model is applied to a short micro panel data while a random effects model is applied to the non-dynamic model upon conducting panel data diagnostic tests. The key multiple ex-post coping strategies households used to cope with shocks include: depleting savings, selling durable assets, receiving unconditional help from a relative, changing dietary patterns involuntarily, doing nothing, taking on more non-farm activities and borrowing. Depleting savings is mainly used by female headed households and household heads with no formal education, which is a recipe for destitution. 'Doing nothing' adopted by male heads of households reveal a state of helplessness while borrowing is unsustainable. A joint hypothesis test reveals that both ex-post consumption smoothing and assets coping strategies aggravate poverty trap among households. Previous period poverty trap accounts for 5.5% of current period poverty trap and is associated with a 26.5% reduction in consumption. Household size, age, education, being a rural dweller and region are critical socio-demographic and location factors in explaining coping strategies' poverty trap aggravating effects. Implementation of well-structured and targeted interventions are critical in addressing this situation.

Keywords: *Poverty-trap, ex-post coping strategies, household, Uganda.*

1. Introduction

Ex-post coping strategies can aggravate poverty trap and lead to destitution among households in low-income countries (Chavez & Luffin, 2022, World Bank, 2022). However, there is paucity of empirical evidence about such a claim in Uganda's case. This study examines how such coping strategies aggravate poverty traps among households to adduce evidence. To do this, three hypotheses are tested: i) Ex-post consumption smoothing (CS) coping strategies do not aggravate poverty trap; ii) Ex-post asset protection coping

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(AS) strategies do not aggravate poverty trap; iii) Both Consumption smoothing and asset protection coping strategies do not aggravate poverty trap. A poverty trap is a state of socio-ecological system in which self-reinforcing mechanisms keep individuals, households or communities in persistent poverty (Radosavljevic et al, 2021; Schlüter, 2018). Poverty on the other hand is a state of lack of basic needs such as food, shelter, education, health, and security. Being in poverty trap implies perpetual coexistence of low-level consumption and assets holding which deprives households of their welfare. Empirical literature elsewhere suggests that some of the coping strategies adopted by low-income households disrupt growth and sustenance of incomes, hence keeping them in poverty trap (Jansen and Carter, 2013). Accordingly, factors associated with the coexistence of such low-level welfare include among others; low asset endowment, low asset returns and the relative inability to cope with shocks leading to pronounced poverty (Nguyen, & Wongchoti, 2023; Esteve-Pérez, Pieri & Rodriguez, 2024; Rosenzweig and Wolpin 1993; Zimmerman and Carter, 2003). Paying attention to the coping strategies used to address the persistently low welfare (poverty trap), arising from shocks including pandemics and climate change impacts, is thus of utmost importance. This is because studies have indicated that during pandemics for instance, savings are the first and most important remedy for households to cope with (Gebrehiwot et al., 2021). However, savings are often not enough to sustain consumption smoothing for long. As a result, some households take on more borrowing given access and others sell their assets, leaving them even more vulnerable to future shocks and risks. Earlier scholars such as Morduch, (1995); Dercon, (2002; (Palomar, 2008); Dercon and Christensen (2011) used micro-level data to highlight possible two-way causality between a given coping strategy and poverty trap. Moreover, low resources endowment greatly increase consumption deficits and deprives households of their livelihoods (Hill & Porter, 2017, Aikaeli, Garcés-Urzainqui, & Mdadila, 2021). This suggests the need to build livelihood resilient mechanisms with effective adoption options to cope with shocks and reduce vulnerability (Teklewold et al., 2019). This is because most of the households are often ill-prepared to cope with negative income and asset shocks such that the materializing risk exacerbates poverty trap. Households already in poverty trap may opt for safer but lower-return “income smoothing” strategies and forego potentially higher-return (but riskier) strategies (De Courson, Frankenhuis, & Nettle, 2024). In addition, some ex-post consumption smoothing coping strategies such as assets depletion, could erode the potential of the productive base of future income earnings, hence deepening the trap situation. However, there is lack of empirical evidence on this for Uganda’s case despite indicators of presence of poverty trap. This study is necessary not only to generate empirical evidence, but also to suggest practical solutions for policy.

2. Literature Review

2.1. Theoretical underpinning

Households’ consumption and asset coping strategies are deeply entrenched in the life-cycle hypothesis (LCH), Modigliani and Brumberg, (1954) and the permanent-income hypothesis (PIH), Friedman, (1957). The LCH states that individuals seek smooth consumption throughout their lifetimes by borrowing when their income is low and saving when their income is high. Likewise, the PIH postulates that households or individual consumption expenditure will always be consistent with their expected long-term average incomes. Their underlying theoretical choice framework recognizes that households’ consumption utility function is intertemporal (i.e. involving multiple time periods). This means, households’ permanent consumption (PC) is a function of permanent income (PY). Assuming absence of external friction, then households’ PY would satisfy two objectives:

i) consumption, ii) savings. The savings objective is considered an ex-ante coping strategy, but PY predicts that households save to guard against declines in future income only if their current income is higher than the anticipated level of permanent income. The PIH assumes that the income generating process is exogenously stationary (externally stable), so that the sole purpose of saving is to accumulate assets for consumption smoothing in some future time. In this case, household savings is a consumption smoothing coping strategy. Nonetheless, shocks may generate multiple dynamic equilibria that drive households to engage in behaviours which destabilize both consumption and savings instead (Carter & Lybbert, 2012; Zimmerman & Carter, 2003). Like the PIH, the LCH postulates that individuals seek smooth consumption by borrowing when their income levels are low and saving when their income levels are high. However, in practice households do not only rely on borrowing and savings, but on multiple other strategies such as, adjusting consumption involuntarily, selling productive assets e.g. land and livestock, selling houses, domestic appliances and depleting savings among others to cope with shocks. Besides, savings levels among low-income households are often too low to support consumption smoothing during bad times, yet borrowing is limited by lack of collaterals. Consequently, the ex-post coping strategies used negatively affect future consumption and asset holding accumulation, which aggravate poverty traps. This is because risky inter-temporal coping choice decisions made under uncertainty cause a deviation from the normative theory (Neumann & Morgenstern, 1953 and Casquilho, 2015). If households choose to smoothen consumption, asset accumulation will decline since most assets will be drawn down to satisfy this objective. On the other hand, if households choose to protect assets, current consumption utility may not be maximized, which may perpetuate poverty trap, suggesting that this is a delicate balance to be met. This indicates that households coping strategies bear a risk which affect consumption as well as assets accumulation functions as presented in sections 3.4 and 3.5.

2.2. Empirical literature review

2.2.1. Asset based coping

Poorer households' incomes most often fall short of what is required to guarantee adequate consumption smoothing (Đikanović, 2018; Morduch, 1995). This situation is worsened by climatic shocks such as droughts and floods, economic shocks, and health crises, which economic literature recognizes as among a multitude of factors perpetuating poverty traps in (Baez et al., 2020, Baez et al., 2018, Caruso, 2017; Wagstaff, 2018; Wagstaff, 2014; Yazbeck et al., 2021). Consequently, households adopt a range of coping strategies, to deal with consumption shocks in the short run. These include both ex-ante activities such as saving money, diversifying income sources and ex-post activities such as borrowing, relying on social networks for support, sell off of assets etc. (Nguyen et al., 2022; Chavez & Lufin, 2022; Esteve-Perez et al., 2024; De Courson, 2024). However, it is noted that poorer households have limited ex-ante strategies. Moreover, ex-post strategies involving assets exhaustion reduces their coping ability in the long run, thus causing them to descend deeper into poverty (Morduch, 1995; Alderman and Paxson, 1994). Additionally, it has been shown that some of these strategies have significant negative implications on consumption and livelihoods among the affected households (Nkuziza et al., 2023; Berloff & Modena, 2013). Acosta et al., (2021), underscores the significance of livestock portfolios in mitigating the impacts of drought on income and consumption. Moreover, consumption smoothing strategies heavily reliant on livestock sales and proceeds have been well explored by Carter and Lybbert, (2012). They revealed that a positive welfare smoothing effect is attained by ownership of large herds of cattle. On the other hand, some

scholars have showed that overall, household incomes diminish significantly in response to covariate shocks in particular, Temesgen et al., (2022), Nguyen et al. (2020). It can be concluded that while using assets to cope with shocks can provide relief in the short run, such strategies are not sustainable in the long run for the poor.

2.2.2. Coping strategies and their impact on human capital development

Human capital related ex-post coping strategies such as child labour and reduction in meals among others have the potential to destroy human capital development capacity (Gebrehiwot et al., 2021; Akotey and Adjasi, 2018). These capacities include child growth and anthropometric indicators. Withdrawal of children from school disrupts households' human capital growth endeavors in education on the one hand. On the other hand, it may have adverse trans-generational consequences on the capacity of the households to escape from such adversaries (Adato et al., 2006). Consequently, the health of their meager incomes, consumption and assets are negatively impacted on by those coping strategies they resort to in trying to uphold some level of welfare (Jansen and Carter, 2013). This suggests that such coping strategies are capable of perpetuating poverty trap status quo among household living in poverty.

2.2.3. Experiences of coping strategies from other countries

Turnbull, et al., (2024), in their study titled "The poverty trap: a grounded theory on the price of survival for the urban poor in Mexico" found that the actions the poor took in tackling poverty threats were costly. Haushofer and Fehr, (2014) and Frankenhuus and Nettle, (2020) argue that such households ultimately remain trapped in poverty. In Cambodia, households that suffered covariate shocks were forced to adopt ex-post coping strategies like selling long-lasting physical assets and over exploiting natural resources (Nguyen et al., 2020). Similarly, a study conducted in Ethiopia found that households that engaged in coping mechanisms such as asset selling and borrowing were more likely to experience a decline in their consumption levels compared to households that did not engage in these mechanisms (Dercon and Krishnan, 2011). Also, Gebrehiwot et al., (2021) argued that households who experienced constant drought in the Rayitu rural district of southeastern Ethiopia adopted interdependently risky coping strategies. In the same vein, Baez et al., (2020) showed that households in Mozambique adopted risky-coping strategies, such as increasing labor supply of their children, depleting savings or selling assets among others. They argued that while these strategies, entailed partial protection in the aftermath of shocks, it comes at the cost of lower income growth potentials for the future. In the rural areas of Nigeria, it was found that price shocks had a significant negative effect on consumption, and the poor households were unable to insure themselves against shocks related to death, livestock loss, climate change, and price changes (Shehu & Sidique, 2015). These studies suggests that risky coping strategies may have negative long-term effects on household consumption and can deplete households' productive assets hence worsening their trap problem. The findings suggest that the adoption of such coping strategies spell a recipe for trap perpetuation. This requires policy targeting for secure coping strategies.

2.2.4. Gaps in Uganda's literature

In Uganda, most of the studies have focused on the determinants of choice of coping strategies, but not their long-term effects on households in poverty trap. Besides, studies

specifically pinning coping strategies as perpetuating poverty trap are scanty. This study addresses itself to these gaps for Uganda's case.

3. Materials and Methods

3.1. Research design

A quantitative longitudinal tracer research design was adopted to examine the effects of ex-post coping strategies on poverty trap among households in Uganda. The design involves following the same households recruited for the Uganda National Panel Surveys (UNPS) over seven years (2013/2014-2019/2020). Longitudinal studies and data are the most suitable in tracking changes in households' socio-economic and demographic attributes including growth in consumption and assets holdings compared to studies based on cross-sectional and time series data. This allows for coherent explanation of the effects of coping strategies on poverty trap.

3.2. Data and data sources

The study uses data from the last four waves (2013/2014, 2015/2016, 2017/2018, 2019/2020) of UNPS collected by Uganda Bureau of Statistics' (UBoS) covering 11,086 households of which 66% are males and 34% females. The UNPS is part of the Living Standards Measurement Survey and Integrated Survey on Agriculture (LSMS-ISA). The data provides detailed information on several socio-economic and demographic indicators including poverty, consumption, assets, shocks and coping strategies. Data was recorded twice per person per wave for four years, making it very good for understanding poverty trap coping strategies dynamics. Based on the initial 2005-2006 UNHS, approximately 3,119 households were followed up per wave. The choice of data from these waves was informed by the completeness of households' enumeration areas (EAs) after one third of the EAs that rotated out of the panel during the 2011/2012 wave were replaced.

3.3. Data management and Diagnostic tests

Different sections of each panel and panel for the various years were merged and appended. Mandatory panel data diagnostic tests, (including consistence checks) conducted include Chow test for poolability of model regressors to see whether they are jointly the same across households and time for a pooled model or varied overtime for application of a non-pooled model. The null hypothesis is that the slope of the regressors are jointly the same regardless of individual household for all k regressors ($H_0 : \beta_{ik} = \beta_k$); while the alternative hypothesis is that the slope of regressors are not the same for all k regressors ($H_1 : \beta_{ik} \neq \beta_k$) and it is tested using the F-test function. The second test is the Hausman test to determine the choice between unbiased fixed and random effects models. This is conducted after rejecting poolability test, under the null hypothesis that the fixed effects model is unbiased, otherwise the random effects model is used. The Lagrangian Multiplier test is applied to tests for presence of heteroscedasticity in panel data. Heteroscedasticity is the violation of the classical regression assumption of constant variation of the error term which implies loss of reliability of the model's predictions and inferences. The Hansen and Arellano and Bond tests, test for over-identification problem. This problem arises when more moment conditions (equations that must hold true) than parameters to estimate, which can lead to inefficiency and consistency of estimators. Autocorrelation in dynamic micro panel models is a problem where errors in a regression model are correlated across time within a panel. This violates a key assumption of classical linear regression, leading

to biased and inconsistent estimates of regression coefficients and potentially misleading standard errors. The data was also subjected to exogeneity test to rule out endogeneity problem. The null hypothesis of exogeneity presumes that independent variables are not correlated with the model error term and ensures unbiased coefficient estimates. Details of the tests results are presented in Table 1.

3.4. Theoretical framework

In terms of theoretical framework, we assume that each household is risk averse and has a well behaved but diminishing marginal utility of consumption smoothing coping strategy function, which is twice differentiable.

$$U(C_{it}) = e^{\theta_{it}} \frac{1}{\theta} (C_{it})^{\theta} \quad (1)$$

and a life time intertemporal utility function

$$U_{it} = \sum_{i=1}^H \sum_{t=1}^T \beta^t U(C_{it}) \quad (2)$$

where C_{it} is household i 's consumption at time t ; θ is a risk preference assumed to be the same across households; β^t is a discount factor. A decrease in household consumption due to poverty results in a net welfare loss. To mitigate this, a representative household uses multiple strategies, sometimes simultaneously to maximize the weighted sum of discounted coping strategies' utilities as in equation 3.

$$Max \sum_{i=1}^H W_i \sum_{t=1}^T \beta_i^t \vartheta_i^s U(C_{it}) \quad (3)$$

Subject

$$\sum_{i=1}^H C_{it} = (C) \quad (4)$$

Where, W_i ($0 < W < 1$) is the weight assigned to household i , ϑ_i^s are coping strategies. C is the total consumption of all households at time t . Based on Pareto optimal consumption utility from the selected coping strategy, the first order condition for the optimization problem of equation (3) subject to (4) is:

$$W_i \beta_i^t \vartheta_i^s U'(C_{it}) = Z_{st} \quad (5)$$

In equation (5), Z_{st} is the Lagrange multiplier for coping strategies s at time t . In order to remove household time fixed effects, equation (5) is transformed into $t+1$ terms and then divided by itself at time t as in (Nguyen, et al., 2022):

$$\frac{U'(C_{i(t+1)})}{U'(C_{i(t)})} \beta_i = \frac{Z_{t+1}}{Z_t} \quad (6)$$

Using equation (1) the left-hand side of equation (6) is rewritten to form equation (7)

$$\frac{U'(C_{i(t+1)})}{U'(C_{i(t)})} = \beta_i e^{\theta \left(\frac{C_{i(t+1)}}{C_{i(t)}} \right)^{1-\theta}} \quad (7)$$

Applying $\frac{Z_{t+1}}{Z_t}$ into the right hand side of equation (7) and taking natural logarithm produces, equation(8);

$$\ln C_{i(t+1)} - C_{i(t)} = \frac{1}{1-\theta} \left[\theta + \ln \frac{Z_{t+1}}{Z_t} + \ln \frac{1}{\beta_i} \right] \quad (8)$$

Equation (8) is households' consumption growth assumed to be driven by the allocation of coping strategies that insure household consumption against idiosyncratic shocks, but cannot insure against covariate shocks. Besides, this model does not handle well the question of asset smoothing yet, it does not show the effects of coping strategies in terms of easing or aggravating the poverty trap situation. Thus, we employ Barro and Sala's Marian, (2004) and Gershon et al., (2020) model to extend the consumption smoothing problem based on a system of differential equations for both consumption and assets. Using this model, consumption and asset smoothing coping strategies are represented by a system of differential equations in which the state variables are household assets (K_a , including savings, S) and consumption (C_c). Starting with assets and borrowing from the neoclassical growth model household level dynamics can be described as in equation (9).

$$\frac{dK_a}{dt} = S(K_a)f(K_a, C_c) - (\delta_0 + r)K_a \quad (9)$$

Where $S(K_a)$ is the household assets savings rate, $f(K_a, C_c)$ the production function depending on assets and consumption, δ_0 household assets depreciation rate and r household growth rate. It is assumed that function f is a Cobb-Douglas production function of the form

$$f(K_a, K_c) = AK_a^{\beta_a} K_c^{\beta_c}; \quad A > 0; \quad \beta_a + \beta_c \leq 1$$

Where parameter A denotes productivity. The savings rate $S(K_a)$ represents the proportion of household assets that are saved and invested in production in anticipation of bad times. Low asset levels mean low savings rate and low capability to cope with shocks. To show that such households can be drawn further into poverty given a shock, the production function is modelled into s-shaped function as shown in equation (10), following Sonja et al., (2021)

$$S(K_a) = S_0 + \frac{S_1}{1 + e^{(S_2 - S_3)K_a}} \quad (10)$$

Where, $S_0, S_1, S_2, S_3 > 0$. The s-shaped outcome of the savings rate strategy is the key factor that suggests poverty trap aggravating coping strategy for the household (Kraay and Raddatz, 2005). Using consumption (food and non-food consumption) as a key variable describing household level dynamics, we analyze the rate of change of consumption as the difference between consumption expenditure and consumption loss, given by equation (11)

$$\frac{dC_c}{dt} = C_c(K_a) + q_c - \delta_c C_c \quad (11)$$

where $q_c \geq 0; \delta_c > 0$, and the function $C_c(K_a)$ defines consumption or consumption expenditure supported by household level assets, q_c is the autonomous consumption and δ_c denotes the consumption loss rate. The level of consumption depends on, and increases with the amount of household assets. Low levels of household assets allow low consumption expenditure, mainly restricted to food purchases, while higher assets levels allow higher consumption expenditures *ceteris paribus*. But asset holdings are not only used to satisfy the consumption smoothing objective, they also are used to satisfy asset protection objectives for the future. If households' consumption smoothing objective is reliant on assets then, assets must saturate at high levels to achieve pareto optimality in consumption and assets protection coping strategies. In this case $C_c(K_a)$ has to be specified as:

$$C_c(K_a) = C_0 + \frac{C_1 K_a^m}{C_2^m + K_a^m} \quad (12)$$

where C_0 is the minimal contribution of assets to consumption smoothing and $C_0 + C_1$ is the maximal contribution while C_2 is the mid-saturation value. This is what defines the effects of coping strategies on the households in poverty trap. The implication is that low level saturations spell aggravated poverty trap state.

3.5. Consumption smoothing model

Building on equations (11 & 12), a parametric consumption model based on the lagged value of the current household consumption expenditure or consumption per Adult Equivalent (AE) is specified. AE defines the proportionate increase in income per adult necessary to maintain a certain level of living standards for a household for changes in demographic circumstances. Since current consumption (C_{it}) is likely to be influenced by previous period consumption [$C_{i(t-1)}$], then economic theory dictates a dynamic econometric model be estimated.

$$C^{hT}_{ipt} = \beta_0 C^{hT}_{i\rho(t-1)} + \beta_1 \sum_{cs=1}^n CS_{ipt} + \beta_2 \sum_{cs=1}^n X_{ipt} + v_{tp} + \mu_{ipt} \quad (13)$$

Where C^{hT}_{ipt} is the total consumption of a representative household i living in poverty trap ρ at time t and $C^{hT}_{i\rho(t-1)}$, represents consumption in the previous period ($t - 1$). CS_{ipt} defines the coping strategies households adopted, while X_{ipt} is a vector of socio-demographic characteristics. β_0, β_1 and β_2 are model parameters, with β_1 being the parameter of interest. v_{tp} captures household specific time effects while μ_{ipt} is the model error term assumed to $IID \sim N(0, \delta^2)$. To maximize consumption utility, total consumption is optimized as function of both i) Food consumption (C^f) and ii) Non-food consumption (nC^f) such that total consumption of a representative household is defined as:

$$C^{hT}_{ipt} = C^f + nC^f \quad (14)$$

And the final change in total consumption which represents smoothing can be specified as:

$$\Delta C^{hT}_{ipt} = \beta_0 \Delta C^{hT}_{i\rho(t-1)} + \beta_1 \sum_{cs=1}^n CS_{ipt} + \beta_2 \sum_{cs=1}^n X_{ipt} + v_{tp} + \mu_{ipt} \quad (15)$$

For the dynamic model or as in (16) for the non-dynamic model

$$\Delta C^{hT}_{ipt} = \sum_{cs=1}^n CS_{ipt} + \beta_2 \sum_{cs=1}^n X_{ipt} + v_{tp} + \mu_{ipt} \quad (16)$$

3.6. Asset smoothing model

Poverty trap is also a low assets or lack of asset growth problem. So households also smooth assets as an ex-ante coping strategy and this may, in the short run have negative effects on households in poverty trap. Following the same building principles as in equation (13), a model for the effect of coping strategies on asset smoothing can be specified, similar to equation (15).

$$\Delta A^h_{ipt} = \alpha_0 \Delta A^h_{i\rho(t-1)} + \alpha_1 \sum_{\sigma=1}^n CS_{ipt} + \alpha_2 \sum_{\sigma=1}^n X_{ipt} + v_{tp} + \mu_{ipt} \quad (17)$$

For the dynamic or as in (18) for the non-dynamic model

$$\Delta A^h_{ipt} = \alpha_1 \sum_{\sigma=1}^n CS_{ipt} + \alpha_2 \sum_{\sigma=1}^n X_{ipt} + v_{tp} + \mu_{ipt} \quad (18)$$

Where ΔA^h_{ipt} defines change in total assets level or value for a household i living in poverty trap ρ in the current period t , while α_s are the model parameters. The rest of the variables remain as defined in 13. Finally, we test the hypothesis that consumption smoothing and asset smoothing coping strategies jointly do not aggravate poverty trap for households already trapped.

$$CS_{ipt} = \Delta C^{hT}_{ipt} = \Delta A^h_{ipt} = PovTrap^h_{ipt} = 0 \quad (19)$$

Where $PovTrap^h_{ipt}$ is poverty trap status of household i in period t .

4.1.1. Analysis, results and discussion

Analysis of how coping strategies perpetuate poverty trap among households focused on two pathways; i) consumption smoothing ii) asset protection. Data was analyzed at uni-variable level to capture household socio-demographic characteristics, bi-variable level (cross-tabulation) to capture the relationship between demographic characteristics and coping strategies and multivariable regression level. Both short dynamic micro panel and RE models were used. Though poolability across households and overtime could not be rejected, Hausmann's tests are considered superior. The null hypothesis of FE model for the effects of coping strategies on consumption and asset smoothing were rejected by Hausmann's test. Consequently, the logit RE model was applied instead to the non-dynamic model because the dependent variable (poverty trap) is a (1, 0) binary count. Also the null hypothesis of exogeneity was rejected for both the dynamic consumption and asset models. This means existence of endogeneity to which a twostep S-GMM model was applied. This model reduces the problem of finite sample biases associated with weak instruments, sensitivity to instrument lags choice and the short data time dimension in ordinary S-GMM, as well as dealing with randomly unbalanced panel data (Roodman 2009a, Nguyen et al,

2022). It estimates a system of equations both in first differences and in levels where Blundell and Bond, (1998) suggest that lagged values of the variables are suitable instruments in the difference equation, and in level equations, lagged differences are used as appropriate instruments. Sargan, Basmann and Hansen J' tests of over-identification were all rejected, implying that instruments were correctly identified for the model and robust standard errors are reported to correct for heteroscedasticity.

Table 1. Diagnostic Test Results for panel data

Name of test	Statistic	Probability	Verdict
Heteroscedasticity			
i) MWTGH in FF regression	Chi2 (1,611) = 0.0001	<0.0001	The null hypothesis of homoscedasticity was rejected. It was concluded that there is presence of heteroscedasticity in data thus, robust results are reported
ii) Breusch-Pagan/Cook Weisberg	Chi2 (01) =242.15	<0.0001	
iii) Cameron & Tgxsghi's decomposition of IM test	Chi2 (8) =97.75	<0.0001	
Autocorrelation (Cumby-Huizinga)			
i) Lag1	Chi2 (19251.38)	0.0587	H_0 of no autocorrelation was rejected
ii) Lag2	Chi2 (19251.38)	0.1659	H_0 of no autocorrelation could not be rejected
Poolability			
i) Time/waves	Chi2 (3) = 0.93	0.8182	H_0 of poolability could not be rejected
ii) Cross-section/households level	Chi2 (1610) =1345.65	1.0000	H_0 of poolability could not be rejected
iii) Joint time/cross-section test	Chi2 (1610) =1345.65	1.0000	H_0 of poolability could not be rejected
Hausmann's Test for FE/RE			
i) Consumption model	Chi2 (15.07)	0.0578	H_0 of FE was rejected, hence RE
ii) Asset holdings' model	Chi2 (4.64)	0.7955	H_0 of FE was rejected, hence RE
iii) Poverty trap model	Chi2 (26.49)	0.0010	H_0 of FE could not be rejected, hence FE
Test of exogeneity			
i) Hansen test exclude groups	Chi2 (2) =1.02	0.601	Do not reject the H_0 of exogeneity
ii) Difference (null H = exogenous)	Chi2 (2) =1.85	0.397	Do not reject the H_0 of exogeneity
iii) GMMs statistic (orthogonality condition)	Chi2 (-18.94)	1.000	Do not reject the H_0 of exogeneity Thus, no endogeneity problem
Test of over-identification			
i) Sargas	Chi2 (4) =3.94	0.414	Reject the H_0 of over-identification
ii) Hansen J	Chi2 (4) =2.86	0.581	Reject the H_0 of over-identification

Source: Author's computation based on UNPS data wave 2013/2014-2019/2020
MWTGH=Modified Wald Test for Groupwise Heteroscedasticity

4.1.2. Poverty trap and consumption expenditure among households

The least mean yearly consumption expenditure recorded among households in poverty trap was UGX 251,380 (67.94at1=UGX 3,700) in 2015/2016. This was the period when poverty rates were beginning to rise from the lowest of 19.7% achieved in 2013. During this period, 18.1% of the households were trapped in poverty.

Table 2. Mean consumption expenditure in nominal shillings (UGX)

Year	Observation	Mean consumption	poverty trap (%)
2013/2014	466	270,091	17.96
2015/2016	504	251,380	18.07
2018/2019	497	260,111	18.13
2019/2020	509	261,148	17.74

Source: Author's compilation from 2013/2014-2019/2020 UNPS Data

4.1.3. Coping strategies adopted by households in poverty trap

The top three consumption and asset smoothing coping strategies among households in poverty trap are i) depleting or relying on meagre savings (26.78%) ii) receiving uncondi-

tional help from a relative (22.48%) iii) changing dietary patterns involuntarily (19.81%). Also “doing nothing else” (9.6%), borrowing (2.74%) mainly from non-formal lenders and household member taking on more non-farm activities (6.92%) ranked high. Over relying on savings could lead to depletion of the meagre resources and hence push households within poverty trap into destitution. Unconditional help from relatives is an altruistic gesture, but also suggests lack of structured government response to the plight of the poor.

Table 3. Percentage of households who used a given coping strategy

Strategy Description	Nature (ex-post, ex-ante)	Percentage
a) Assets based coping strategies		
1. Sold land/building	ex-post	0.18
2. Rented out agricultural land	ex-post	0.17
3. Distressed selling of livestock	ex-post	1.31
4. Sold durable household assets e.g. TV sets	ex-post	1.65
5. Relied on meagre Savings	ex-post	26.78
b) Human capital based coping strategies		
1. Changed dietary patterns involuntarily	ex-post	19.81
2. Reduced expenditure on education and health	ex-post	0.32
3. Sent children elsewhere	ex-post/ex-ante	0.37
4. Migrated	ex-post/ex-ante	0.27
c) Socio-Economic coping strategies		
1. Borrowed/Obtained credit (from non-financial market)	ex-post	2.74
2. Unconditional help by a relative	ex-post	22.48
3. Unconditional help by Government	ex-post	1.53
4. Household member took on more farm activity	ex-post/ex-ante	1.96
5. Household member took on more non-farm activity	ex-post/ex-ante	6.92
6. Change of cropping choice/practices	ex-post/ex-ante	1.93
d) Other coping strategies		
1. Do nothing (nothing else to do)	ex-post/ex-ante	9.60
2. Others	ex-post/ex-ante	1.98

Source: Author’s compilation from 2013/2014-2019/2020 UNPS Data

Involuntary change in dietary patterns can erode human capital development for the future especially calorie intake among children. Heavy reliance on savings and borrowing rob victims of their capacity to cope with future shocks, hence leaving them worse off.

4.2. Coping strategies by selected household socio-demographic characteristics

4.2.1. Coping strategies by Sex

Sex of household head is important in defining critical coping choice decision making power. This is crucial when targeting policies to address coping strategy challenges at household level as lack of capacity may weaken heads’ decision making powers. In Figure 1, female headed households relied more on their savings compared to their male counterpart, suggesting the critical role women play. Depleting such savings could spell disaster to the household. On the other hand borrowing, engaging more in non-farm activities, “do nothing” and receiving unconditional help from a relative were used more among male headed households.

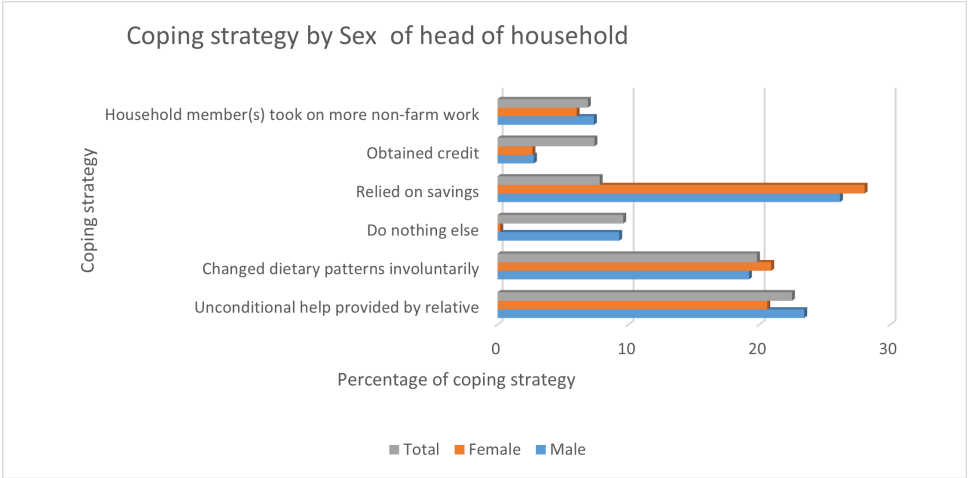


Figure 1. Coping strategies by the sex of the head of household
Source: Authors computation based on UNPS 2013/2014-2019/2020

4.2.2. Coping strategies by households dwelling location

Dwelling location refers to where households reside, which is either rural or urban. It is important because different coping strategies may be adopted by urban and rural dwellers which enlist differences in policy targeting. Results in Figure 2 shows that households dwelling in rural settings relied more on savings compared to those in the urban areas. On the other hand, households in the urban dwellings relied more on unconditional help from a relative and involuntary change of dietary patterns, which is common for the urban poor who get food support from the rural relatives. It is noted that while households’ reliance on unconditional help from relatives is an altruistic gesture, the strategy is structurally not sustainable.

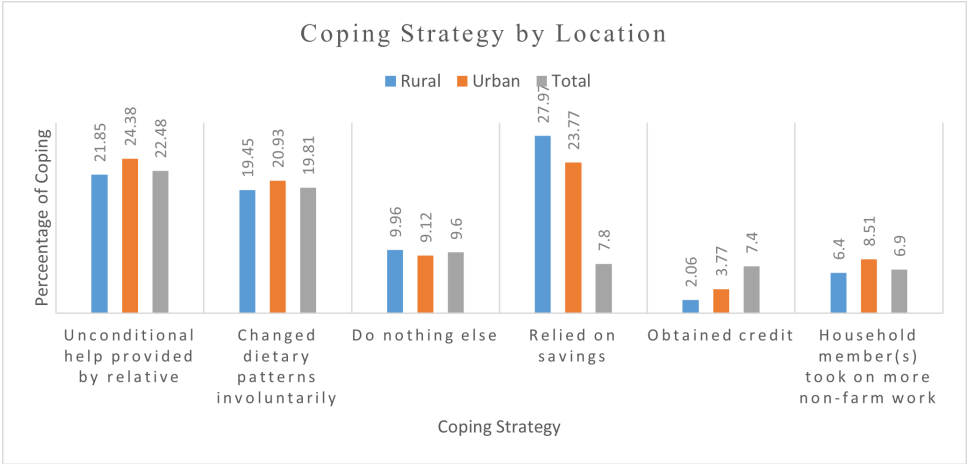


Figure 2. Coping strategies by households dwelling (Urban or Rural)
Source: Authors computation based on UNPS 2013/2014-2019/2020

4.2.3. Coping strategies by Household size

Household size is key in driving decisions to adopt specific coping strategies. This is because the larger the size, the more the resources required to sustain it and the higher

the costs. Results show that small sized households rely on savings and taking on more non-farm activity as their top coping strategies, while larger households rely more on Unconditional help by a relative and borrowing. Average sized households involuntarily changed dietary patterns as their number one coping strategy. Unconditional help and informal borrowing for consumption smoothing is not only unsustainable, but also leaves households in a precarious state.

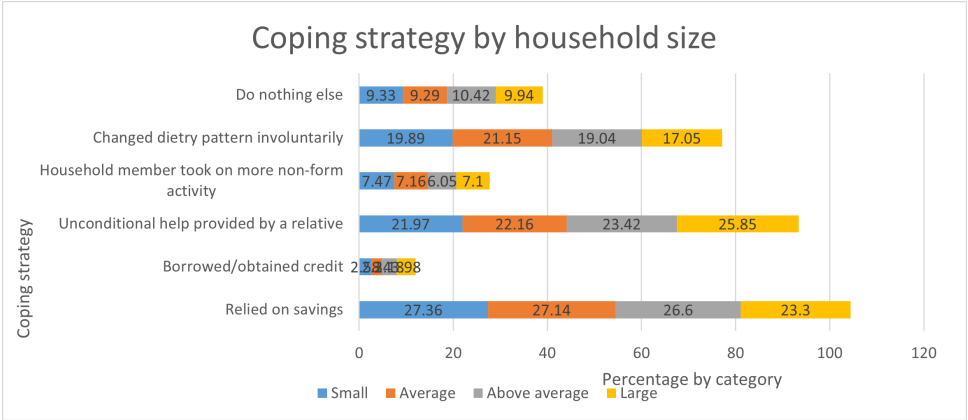


Figure 3. Coping strategies by household size
 Authors computation based on UNPS 2013/2014-2019/2020

4.2.4. Coping strategies by education of household head

It is believed that education empowers household heads to take informed decisions regarding coping strategies when faced with calamities. This can influence the choice of coping strategy when compared with household heads with no formal education. Figure 4 shows variation in coping strategies by level of education of head of households. Household heads with no formal education used savings, Unconditional help by a relative and taking on more non-farm activities more compared with other coping strategies. Surprisingly, household heads with post-secondary education level adopted more involuntary change of dietary patterns and “Do nothing else” coping strategies than others. Reliance on savings by households with no education, could lead to depletion of their meagre savings which could aggravate poverty.

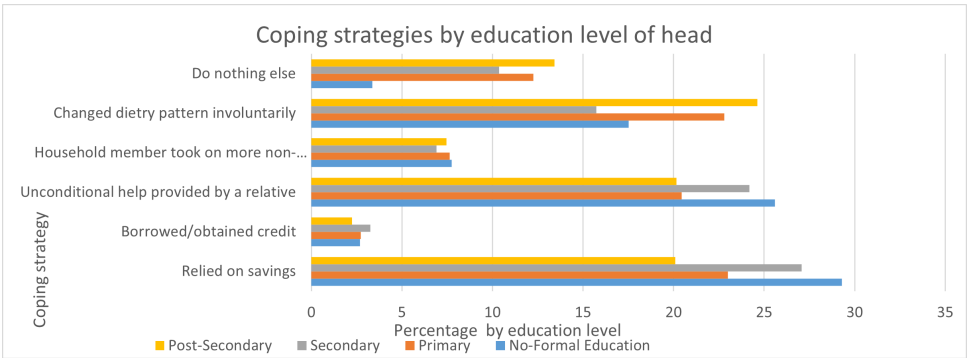


Figure 4. Coping strategies by education of household head
 Source: Authors computation based on UNPS 2013/2014-2019/2020

4.2.5. Coping strategies by region

Delving into the distribution of coping strategies by region is important in crafting policies targeting region specific concerns. This is mainly due to economic growth imbalances across the regions attributed to geographical location. Accordingly, households in the eastern region used the strategy of savings more than households from other regions. Households in the northern region used borrowing and Unconditional help by a relative to cope, which mimics the era of internal displacement during Lord’s resistance rebellion when households depended on handouts. Households in the western region took on more non-farm activity and involuntarily changed dietary patterns as coping strategies.

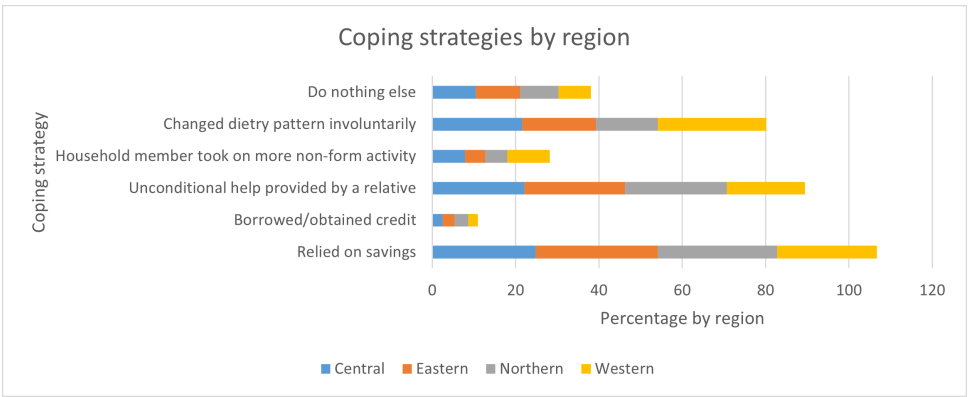


Figure 5. Coping strategies by Region

Source: Authors computation based on UNPS 2013/2014-2019/2020

4.2.6. Effects of coping strategies on households’ in Poverty trap (Dynamic SGMM Model)

Coping strategies can aggravate poverty trap among households through consumption smoothing and asset protection. It is assumed that both consumption and assets holding in the current period (t) are a function of their previous periods ($t-1$). Four short dynamic SGMM models; that is to say the general consumption per AE (M1), expenditure on food consumption (M2), asset holding growth (M3) and poverty trap (M4) were each run against their lagged values and results are presented in Table 7. The AE in M1 is that developed by UBOS, where household expenditure is adjusted to account for scale and varying needs of individuals within a household in terms of children versus adults. AE scales provide a more realistic representation of household welfare, which is essential for identifying and measuring poverty. M2 is exclusively food consumption, the interest is on how much of the poverty trap is a food consumption coping problem. Likewise M3 is the monetary value of assets over the study period. Lack of asset growth means incapacity to cope. M4 in this model is the households’ poverty trap state. For a household to be trapped, it must be in such a state (below the poverty line) for at least two out of the four waves of this study as presented in equation 20. Where PS=poverty state, PT=poverty trap, $t_{-3}, \dots, t$ = panel waves, 1 = poor and 0 = non poor.

$$PS = \begin{pmatrix} t_{-3} & t_{-2} & t_{-1} & t \\ 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} PT \\ 1 \\ 1 \\ 1 \\ 0 \end{pmatrix} \quad (20)$$

Table 4. Effects of coping strategy on households in poverty trap

	Model1	Model2	Model3	Model4
Dynamic model				
LnIngPov_trap	-0.0012		-0.321	0.055* (0.00)
LnIng_food consumption expend		-0.753*** (0.00)		
LnIng_asset value			-0.909*** (0.00)	-0.003 (0.97)
Lnconsumption expenditure				-0.265*** (0.00)
Coping strategy	0.0013** (0.01)	0.013 (0.54)	0.151** (0.01)	-0.016 (0.42)
Household size^2	-0.771*** (0.00)	-0.004 (0.91)	-0.009 (0.83)	0.006** (0.01)
Age^2	0.009** (0.01)	0.001 (0.92)	-0.001* (0.06)	-0.001 (0.81)
Sex (Female head)	0.001 (0.95)			
Constant	8.565*** (0.00)	11.941** (0.02)	25.067*** (0.00)	3.691*** (0.00)
Observations	5949	2320	366	
Sargan overid chi2(6), (4), (2)	0.58	0.83	0.45	0.31
Prob>chi2	0.997	0.934	0.797	0.959
Hansen overid chi2(6), (4), (2)	0.71	0.99	0.61	0.59
Prob>chi2	0.994	0.911	0.737	0.899
Hansen exogeneity chi2(6), (4), (2)	0.65	0.22	0.58	0.43
Prob>chi2	0.957	0.895	0.447	0.806

Statistical significance level: *** p<0.01, ** p<0.05, * p<0.1

In model1, while previous period (t-1) consumption per AE negatively affects current consumption per AE, adopting an ex-post coping strategy increased consumption per adult equivalent by 0.13% at the 5% level of statistical significance. As household size becomes larger, consumption per AE reduced significantly by 77% and is statistically significant at the 1% level. On the other hand, consumption per AE increased by 0.9% as the number of older persons increased at the 5% level of statistical significance. In model2 (food consumption expenditure), current food consumption expenditure (C_t^f) is a negative function of the previous period food consumption expenditure (C_{t-1}^f). In this case, 75.3% of the reduction in current food consumption expenditure were a function of the previous period expenditure reduction at the 1% level of statistical significance. However, it is noted that while the effect of coping strategies was positive on food consumption, it was not statistically significant. In terms of asset holding growth (model3), again current period asset growth (A_t) is a negative function of previous period asset holding (A_{t-1}). At the 5%

level of statistical significance, 91% of the reduction in growth of asset holding were driven by previous period reduction. Nonetheless, asset smoothing coping strategies increased assets by 15.1% at the 5% level of statistical significance. In M4, current period poverty trap (pov_trap_t) is a positive function of the previous period poverty trap (pov_trap_{t-1}). Consequently, pov_trap_t increased by 5.5% at 10% level of statistical significance, and households' consumption expenditure reduced by 26.5% at the 1% level of statistical significance during the study period. In line with earlier results, as household size increases the likelihood of poverty traps increase by 0.6% at the 5% level of statistical significance during this period.

4.2.7. Effects of coping strategies on poverty trap (Non-dynamic Logit RE model)

This model is used to robust check the results of the dynamic models. Three models; that is to say food consumption (M1), non-food consumption (M2) and asset growth (M3) all based on a random effects model were run and results are presented in Table 5.

Table 5. Effects of coping strategies on households in poverty trap (non-dynamic models)

	Model1	Model2	Model3
Unconditional help provided by relative	-0.523	-0.054	
Unconditional help provided by local gov't	-0.153	-0.158	0.065***
Changed dietary patterns involuntarily	0.100	-0.045	0.054***
Changed cropping practices (crop choice)	0.437***	-0.201**	0.060***
Household member(s) took on more non-farm work	0.120	0.052	0.038***
Household member(s) took on more farm work	-0.524***	0.046	0.038***
Household member(s) migrated	0.049	-0.083	0.023***
Relied on savings	0.140	-0.096*	0.048***
Obtained credit	-0.080	0.022	0.066***
Sold durable household assets (agricultural)	0.568*	-0.245**	-0.114**
Sold land/building	-0.257	0.216	
Rented out land/building	-0.223	0.007	
Distress sales of animal stock	0.784	-0.143	0.027*
Sent children to live elsewhere	0.959***	0.323	0.007
Reduced expenditures on health and education	-0.062	-0.267**	0.017***
Other strategies	0.446*	-0.307***	0.090***
Female	0.039	-0.029	0.003
Age	-0.006	0.021***	-0.009***
Marital status	-0.042	-0.013	0.006***
No formal education	-0.087	-0.301***	-0.036**
Primary education	-0.202	0.008	-0.008*
Secondary education	-0.134	-0.061	-0.001
Household size	-0.003	0.167***	-0.001
Household size ²	0.001	-0.006***	0.001
Rural (urban base)	0.157*	-0.353***	0.003
Eastern region	-0.137	-0.366***	0.005
Northern region	0.003	-0.462***	-0.019***
Western region	0.131	-0.219***	-0.006**
Constant	7.711***	11.81***	0.308***
Observations	1,180	2,299	438
Within	0.019	0.215	0.949
Between	0.034	0.284	0.012
Overall	0.030	0.268	0.017
sigma_u	0.196	0.193	0.020
sigma_e	1.257	0.629	0.005
rho	0.023	0.086	0.999

Statistical significance level: *** p<0.01, ** p<0.05, * p<0.1

Model1 = food consumption; Model2 = non-food consumption; Model3 = Asset smoothing

4.2.8. Joint hypothesis test of the effect of coping strategies on poverty trap aggravation

The null hypotheses that consumption (CS) and asset smoothing (AS) coping strategies jointly do not aggravate poverty trap (PT) among households already living in trap is tested against the alternatives. Results are presented in Table 6.

Table 6. Hypotheses test results of coping strategies aggravating poverty trap

Hypothesis Test	Coefficient
Consumption smoothing=Poverty trap=0	23.16**
Asset smoothing=Poverty trap=0	27.25***
Consumption smoothing=asset smoothing=Poverty trap=0	27.59***
*** p<0.01, ** p<0.05, * p<0.1	

Drawing from Table ,6 the null hypotheses ($H_0 : CS = PT = 0; H.AS = PT = 0; H_0 : CS = AS = PT = 0$) are all rejected because the coefficients of test statistics are statistically significant at 1%. It is concluded that both consumption and asset smoothing ex-post coping strategies aggravate poverty trap for households already trapped. So efforts to pull such households out of the trap by use of targeted, comprehensive interventions need to be intensified. A summary of the study key findings is provided in Table 7.

Table 7. Summary of models key findings

a) Current food consumption expenditure and assets growths are a negative functions of their previous periods. This means that lack of growth in the previous period is extended to the current period which signals poverty trap perpetuation. b) Consumption smoothing and assets protection coping strategies aggravate poverty trap among households. This requires a delicate balance in policy targeting to households. c) Distress selling of livestock and durable assets provides a temporary relief on consumption smoothing, but reduces assets growth in the medium to long run period. This diminishes households’ capability to cope in the long run. d) Current period poverty trap is a positive function of previous period poverty trap. This means households that are in poverty trap in the previous period are more likely to be in poverty trap in the current period and by extension in the next period e) Key socio-demographic and location control factors which play a key role in catalyzing the effects of coping strategies on poverty trap include large household sizes, age of household head, lack of formal education of household head, rural households and households in northern and eastern regions specifically.
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4.3. Summary and conclusion

The overall objective of this study is to examine how ex-post coping strategies perpetuate poverty trap among on households in Uganda. A two stage S-GMM model is applied to the short dynamic micro panel model, while REM for the non-dynamic model. Households use multiple coping strategies, but the top three are: i) relying on savings, ii) receiving unconditional help from a relative, iii) changing dietary patterns involuntarily. Female headed Households used these strategies most, indicating vulnerability. Depleting savings are used by female headed households, household heads with no formal education

and in rural settings, which is a recipe for destitution. Other coping strategies that ranked highly among households include ‘doing nothing else’ mainly by male headed households revealing a state of helplessness, taking on more non-farming activities is mainly employed by households in western Uganda and borrowing from mainly non-formal financial markets. Results from both the dynamic non-dynamic models show that ex-post consumption smoothing coping strategies like depleting savings and selling of durable assets increase the likelihood of food consumption in the short run but reduce the likelihood of asset accumulation on the other hand. This is likely to affect future consumption smoothing, thus sustaining the poverty trap status quo. Also, asset smoothing strategies such as reducing expenditure on education and health are considered to be detrimental to human capital development in the long run for the affected households. Joint hypothesis test results show that both consumption and asset smoothing coping strategies aggravate the already existing poverty trap situation among households in Uganda. The affected households could remain in poverty trap spanning over many generations into the future if no serious, well-structured and targeted interventions are implemented. These findings suggest policy targeting that should protect households’ from depleting their meager savings and selling durable assets such as livestock, land, house and household appliances to cope with shocks. These may include targeted social safety nets such as cash transfers to the most vulnerable and livestock buffer stock building by government.

4.4. Recommendations

Based on the study findings the following recommendations are made:

- a) A comprehensive, well-structured and targeted poverty trap reducing interventions including social safety nets such as cash transfers should be implemented to ease consumption smoothing among households trapped in poverty
- b) Government should build livestock buffer stocks and support other strategies of accumulating assets such as VLSA for vulnerable households to avoid distress selling of livestock and other durable assets as only sources coping strategies.
- c) A targeted hands on skilling and capacity building support should be given to household heads with no formal education and living in the rural settings to increase their production capacity and assets accumulation,

4.5. Limitations of the study

1. This study exclusively focused on Uganda’s case for the poverty trap dynamics, which means that the findings cannot be generalized beyond Uganda.
2. A non-experimental short panel data of 4 waves was used and this has limited the insights that could have been generated with a long panel of many waves.
3. The study is only quantitative, which limits insights from the qualitative approach.

4.6. Areas for future Research

1. Panel data of many waves should be used to conduct a similar study to understand fuller impact of coping strategies on poverty trap
2. A qualitative follow-up of this study need to be conducted to complete the story about poverty trap and coping strategies in Uganda

3. An experimental study design based on randomized control trials need to be conducted to provide further proof of the specific coping strategies perpetuating poverty traps

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